

This Page Is Inserted by IFW Operations
and is not a part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

**As rescanning documents *will not* correct images,
please do not report the images to the
Image Problem Mailbox.**



Consommation
et Corporations Canada

Bureau des brevets

Ottawa, Canada
K1A 0C9

Consumer and
Corporate Affairs Canada

Patent Office

(11) (C) **1,307,568**

(21) 556,916

(22) 1988/01/20

(45) 1992/09/15

(52) 339-92

⁵

(51) INTL.CL. H01R-13/627; H01R-13/639

(19) (CA) **CANADIAN PATENT** (12)

(54) Latching Apparatus for an Electrical Connector

(72) Noorily, Peter , U.S.A.

(73) Thomas & Betts Corporation , U.S.A.

(30) (US) U.S.A. 006,418 1987/01/23

(57) 15 Claims

Canada

CCA 3254 (10-89) 41

556916

1

LATCHING APPARATUS FOR AN ELECTRICAL CONNECTOR

5

ABSTRACT

10

15

20

25

30

35

A latching apparatus is provided for an electrical connector of the type having a housing including a plurality of electrical contacts therein. The latching apparatus comprises a deflectable arm that is pivotally supported on the connector housing, the pivot being disposed generally between the two ends of the pivotal arm such that both opposed ends of such arm may move relatively toward and away from the connector housing. The front end of the deflectable arm is provided with a latch for attachment to a complementary latch of a mateable electrical connector or the like. A slidably locking bar is captively supported on the housing for movement between a first position and a second position. The locking bar and deflectable arm include cooperative locking means disposed on both sides of the pivot that are operative in the first position to prevent movement of both ends of the latching arm and in the second position to permit free movement of both arm ends. As such, when the bar is in the first position, secured locking engagement of the latch is provided when attached to the mateable connector, while when the locking bar is in the second position, the free movement of the deflectable arm permits ease of attachment to or detachment from the mateable connector.

LATCHING APPARATUS FOR AN ELECTRICAL CONNECTOR1 FIELD OF THE INVENTION:

The present invention relates to an improved latching apparatus for an electrical connector that is particularly useful in the data communications industry.

5 BACKGROUND OF THE INVENTION:

In the use of electrical connectors there is need to provide secured mechanical and electrical engagement between the electrical connector and a mateable electrical connector or other electrical device or equipment. Various latching techniques have been devised for use with electrical connectors in an effort to provide such secured engagement. One of the concerns in providing this secured engagement is the ease with which the connectors may be both attached to and detached from other devices. To satisfy this concern, connectors having latching mechanisms comprising pivotally supported latching arms that facilitate both ease of attachment and detachment have been developed. For example, latching structures of this type are shown in U.S. Patent 4,449,778 (issued on May 22, 1984) and U.S. Patent 4,501,459 (issued on February 26, 1985), both of these connectors being of the electrically shielded type for particular use in the data communications industry. While the pivotal latching arms, as shown in these patents, assist in the ease of attachment and detachment, there is no positive locking structure that maintains the connector in secured relation once connected to another connector or other electrical component. In an effort to compensate for this problem, a separate, external wedge is provided for subsequent attachment to the electrical connector in a manner to prevent the latching mechanism from separating in use.

In another known shielded electrical connector a latching structure is provided to not only facilitate the



10 ease of attachment and detachment but also to provide a locking device while the connector is in use. In U.S. Patent 4,619,494 (issued on October 28, 1986) and assigned to the same Assignee as is the subject application, the latching mechanism includes a slidable actuator that moves a pivotal latching arm in a manner to control both attachment and detachment as well as to serve as a lock to provide secure engagement while the connector is in use. While it is advantageous to maintain some of the features of the known connectors and their latching mechanisms, it is also desirable to provide improvements thereto, considering both cost and ease of use.

SUMMARY OF THE INVENTION:

It is an object of the present invention to provide an improved latching apparatus in an electrical connector.

20 In accordance with a preferred form of the invention, an improved latching apparatus is provided in an electrical connector of the type having a housing and a plurality of electrical contacts therein. The latching apparatus comprises an elongate member deflectably supported by a pivot on the housing, the pivot being located generally intermediate such elongate member. As a result of such pivotal support, at least one longitudinal end of the elongate member may move generally transversely toward and away from the housing. The one end of the elongate member includes a latch for latching to a latch of another mateable connecting device. The latching apparatus further includes a movable locking bar captively supported on the housing for slidable movement thereon between a first position and a second position. The locking bar and the elongate member include cooperative locking means disposed on both sides of the pivot, operative when the locking bar is in the first position to prevent transverse movement of the one end of the member and non-operative when the locking

sd/rr

1 bar is in the second position, thereby permitting
5 ~~the one end~~ transverse movement of ~~both ends~~ of the elongate member.

BRIEF DESCRIPTION OF THE DRAWINGS:

5 Figure 1 is a side perspective view of a shielded electrical connector embodying the improved latching apparatus of the subject invention.

10 Figure 2 is a top plan view of the slidable locking bar of the subject latching apparatus.

15 Figure 3 is a side elevation view of a portion of the housing of the electrical connector of Figure 1 showing the latching apparatus with the locking bar disposed in a first position wherein the latching arm is in a locked condition.

20 Figure 4(a) is a side elevation view, as in Figure 3, now showing the locking bar in a second position wherein the latching arm is free to pivot, the latch at the mating end being shown in an upward position.

25 Figure 4(b) is a side elevation view, as in Figure 4A, wherein the locking bar is in the second position and wherein the latching arm is pivoted such that the latch at the mating end is in a downward position.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT:

30 Referring now to the drawings, there is shown in Figure 1 an electrical connector 10 of the shielded type as more particularly shown and described in commonly owned Patent U.S. 4,619,494 as referred to hereinabove. Briefly, connector 10 comprises an insulative housing 12, a front end 12a of which defines a mating end of the connector and a rear end 12b of which is adapted to receive a shielded electrical cable 14 for internal connection to a plurality of electrical contacts (not shown) supported interiorly of the housing 12. Latching apparatus 15, as will be described in more detail hereinbelow, is incorporated in electrical connector 10. It should be appreciated, 35 however, that the latching apparatus of the subject

1 invention, while particularly useful in the type of
electrical connector as shown herein, is not so limited and
may be used with other electrical connectors.

5 Turning now also to Figure 2, Figure 3 and
Figures 4(a) and (b), the details of the latching apparatus
may be more fully understood. Latching apparatus 15
comprises a relatively rigid, deflectable latching arm 16
that is pivotally mounted on the housing cover 18 and a
10 slidable locking bar 20. Housing cover 18 is a portion of
the housing and is preferably separable from the remainder
of the electrical housing 12 in a manner to facilitate the
termination of the electrical cable 14 to the connector
contacts supported in the housing. The deflectable arm 16
15 is attached to the cover 18 by a flexible web 22 such that
the arm 16 is upwardly spaced from and pivotally movable on
the cover 18. The deflectable arm 16 is generally
elongate, the arm 16 being supported on the cover 18
intermediate its front end 16a and its rear end 16b. As
such, both the front end 16a and the rear end 16b of the
20 flexible latching arm are movable generally transversely
toward and away from the cover 18 of the electrical
connector housing. The front end 16a of the arm is
particularly configured to provide a latch thereat for
mechanical engagement with a complementary latch of another
25 electrical connector or other electrical device. Adjacent
the front end 16a of the deflectable arm and disposed on
its lower surface is a downwardly projecting member
defining a locking spacer 24. At the opposite end 16b of
the arm, a generally curved recess 26 is formed in the
30 lower surface of the arm 16. The function and purpose of
the arm locking spacer 24 and the recess 26 will be
described hereinafter.

35 The slidable locking bar 20 is relatively rigid
and is of generally planar construction. At the rear end
of the locking bar there is provided an upwardly extending
handle 28 adapted for manual grasping and operation of the

1 latching apparatus by the user. Upwardly extending from
the upper surface of the locking bar 20 is a projection
defining a bar locking spacer 30, locking spacer 30 being
adapted and configured for engagement with the deflectable
5 arm 16. The front end of the locking bar comprises a
downwardly tapering surface 32 adapted for engagement with
the locking spacer 24 of the deflectable arm 16.

As shown particularly in Figure 2, the locking
bar 20 includes at its front end 20a a pair of spaced tines
10 34 defining a slot 36 therebetween, tines 34 being
resiliently laterally deflectable toward and away from each
other. In the preferred form, the bar locking spacer 30 is
of two-part construction with a space therebetween.
Locking bar 20 further includes adjacent its front end 20a
15 a generally curved upwardly extending protrusion 38
disposed on either side of the slot 36.

The sliding bar 20 is captively supported for
sliding, longitudinal movement between the deflectable arm
16 and the housing cover 18. In the preferred
20 configuration the flexible web 22 is of two-part
construction with an opening (not shown) therebetween. The
resiliently deflectable tines are inserted through the
opening between the two-parts of the web 22, laterally
deflecting the tines until shoulders 34a of each tine
25 pass through the web opening. Shoulders 34a and rear
surfaces 20b serve to captivate the sliding bar about the
web 22. Longitudinal sliding of the locking bar 20 is
controlled by guide blocks 35 (see Fig. 1) disposed on the
cover 18 and which engage the side, marginal edges of the
30 locking bar during movement.

Referring now to Figures 3 and 4(a) and 4(b), the
operation of the latching apparatus is more fully
described. In Figure 3, the locking bar 20 has been moved,
35 by use of the handle 28, longitudinally to a first position
which defines a locking position of the latching arm 16.

1 In this position, the front surface 32 of the sliding bar
20 is in engagement with the downwardly projecting arm
locking spacer 24 and the bar locking spacer 30 is engaged
in the recess 26 of the deflectable arm 16. As the
5 engagement of the respective locking spacers 24 and 30 is
provided on both sides of the pivot 22 supporting the
deflectable arm 16, transverse movement of both ends 16a and
16b of the arm 16 is effectively prevented. As such, in
10 connector use, the latch provided at the front end 16a of
the arm is maintained in a positive locking position
thereby preventing inadvertent disconnection during use
which could occur due to vibrations and the like. The
locked position is releasably held by a detent that is
15 provided by the resilient receipt of the top of the bar
locking spacer 30 in the arm recess 26. This detent is
overcome by manually pulling the locking bar 20, leftwardly
in the drawing figures.

20 Turning now to Figures 4(a) and 4(b), the
facilitation of attachment to and detachment from other
connectors or electrical components is shown. In Figure
4(a) the locking bar 20 has been slid longitudinally
rearwardly to its second position. In this position, bar
locking spacer 30 has been pulled out from the recess 26 of
the deflectable arm 16 and the bar front engagement surface
25 32 has been separated from the arm locking spacer 24. As
such, both the front end 16a and rear end 16b of the
deflectable arm 16 are free to move transversely toward and
away from the cover 18. In this second position, the
30 protrusion 38 on the locking bar 20 is disposed at a
location coincident with the pivot 22. As such, the
protrusion 38 will contact the undersurface of the arm in a
manner to minimize any loose movement of the locking bar 20
that could result in this position inasmuch as the locking
bar is held only at the rear of the connector by the guide
35 blocks 35.

1 In Figure 4(a), for example, as a result of a
downward force on the rear end 16b, as represented by arrow
40, the front end 16a is pivoted upwardly away from the
cover 18. In use, the latch at the front end 16a of the
5 arm is thereby permitted to be attached to or detached from
another latch, generally shown by reference numeral 42,
from this upward position. On the other hand, as shown in
Figure 4(b), when the locking bar 20 is in the second
position, the front end 16a of the latch arm 16 may also be
10 deflected downwardly by a force as represented by arrow 44.
As such, the latch at the front end 16a of the arm may be
resiliently snapped into a locking position with the latch
42 of another connector.

15 Having described the preferred embodiment of the
latching apparatus of the subject invention, the advantages
thereof should be now appreciated. The subject latching
apparatus not only provides for ease of either attaching or
detaching an electrical connector to or from a mateable
20 component, but also provides a secured locking arrangement
when the connector is attached to another connector or the
like. It should be further appreciated that various
modifications may be made to the subject latching apparatus
without departing from the contemplated scope of the
invention. Accordingly, the preferred embodiment described
25 herein is intended in an illustrative rather than a
limiting sense. The true scope of the invention is set
forth in the claims appended hereto.

30

35

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. In an electrical connector of the type having a housing and a plurality of electrical contacts therein, latching apparatus comprising:

an elongate member deflectably supported by a pivot on said housing, said pivot being located generally intermediate said elongate member such that at least one longitudinal end of said member may move generally transversely toward and away from said housing, said one end of said member including a latch for latching to a latch of another mateable connecting device, and

a movable locking bar captively supported on said housing for slidable movement thereon between a first position and a second position, said locking bar and said member including cooperative locking means disposed on both sides of said pivot operative when said locking bar is in said first position to prevent transverse movement of said one end of said member and non-operative when said locking bar is in said second position, thereby permitting transverse movement of said one end of said member.

2. The invention according to claim 1, wherein said pivot comprises a flexible web.

3. The invention according to claim 1, wherein said locking bar is substantially planar and is slidably captivated between said housing and said member for sliding movement in the longitudinal direction.

4. The invention according to claim 3, wherein said cooperative locking means includes a locking spacer on said member and on said locking bar.

5. The invention according to claim 4, wherein locking spacer

Claim 5 continued

1307568

on said locking bar projects in a direction toward said member and away from said housing and the locking spacer on said member projects in a direction toward said locking bar and said housing.

A

1 6. The invention according to claim 5, wherein said member
2 locking spacer is located adjacent said latch and wherein
3 said bar locking spacer is located adjacent the opposing
4 end of said member.

1 7. The invention according to claim 6, wherein said member
2 has at its end opposite said latch a detent recess for
3 detachable engagement with said bar locking spacer.

1 8. In an electrical connector of the type having a housing
2 including a plurality of electrical contacts, said housing
3 having a mating end for connection to another electrical
4 connector, latching apparatus comprising:

5 an arm pivotally supported on said housing, said
6 arm having two opposed ends, one end of which includes a
7 latch adjacent the mating end of said connector, a pivot
8 being disposed between said two ends of said arm to thereby
9 permit movement of both of said ends toward and away from
10 said housing; and

11 a slidable locking bar, captively supported on
12 said housing for movement between a first position and a
13 second position, said bar including a locking spacer
14 disposed adjacent one end of said arm and said arm
15 including a locking spacer disposed adjacent the opposite
16 end of said arm, said bar locking spacer being engageable
17 with said arm and said arm locking spacer being engageable
18 with said bar when said bar is in said first position to
19 thereby prevent movement of both of said arm ends relative
20 to said housing, said bar locking spacer being in
21 non-engaged relation with said arm and said arm locking
22 spacer being in non-engaged relation with said bar when
23 said bar is in said second position to thereby permit
24 movement of both ends of said arm relative to said
25 housing.

1 9. The invention according to claim 8, wherein said arm is
2 pivotally supported on said housing by a flexible web
3 providing a space between said arm and said housing.

- 1 10. The invention according to claim 9, wherein said bar
- 2 is slidably captivated in said space.
- 1 11. The invention according to claim 9, wherein said arm
- locking spacer is located adjacent said latch and said bar
- locking spacer is located adjacent the opposite end of said
- 4 arm.
- 1 12. The invention according to claim 11, wherein said arm
- locking spacer projects outwardly from said arm toward said
- locking bar and wherein said bar locking spacer projects
- 4 outwardly from said bar toward said arm.
- 1 13. The invention according to claim 12, further
- comprising detent means on said arm and locking bar for
- releasably holding said locking bar in said first
- 4 position.
- 1 14. The invention according to claim 13, wherein said
- detent means comprises said bar locking spacer and a recess
- formed in said arm at the end opposite said latch for
- resilient receipt therein of a portion of said bar locking
- 5 spacer.
- 1 15. The invention according to claim 8, wherein said
- locking bar further includes thereon an upwardly projecting
- protrusion disposed on said bar to coincide with the
- location of said pivot when said locking bar is in said
- 5 second position, said protrusion being adapted to contact
- said arm thereat in a manner to minimize loose movement of
- 7 said locking bar.



FIG. 1

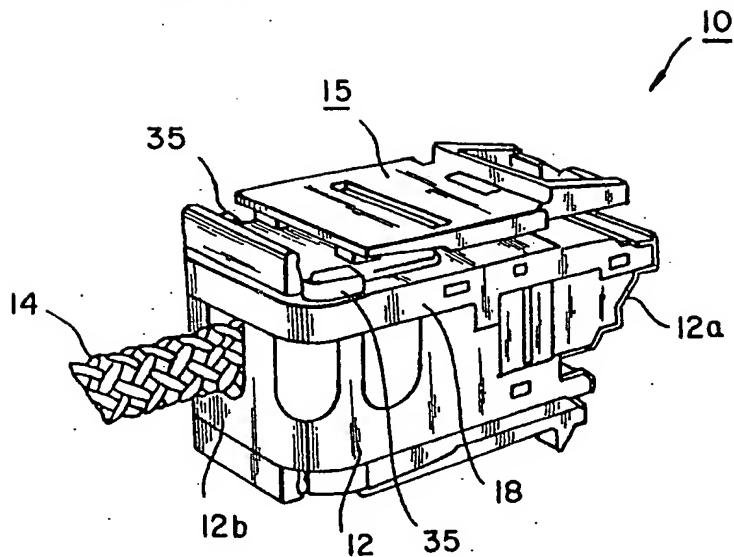


FIG. 2

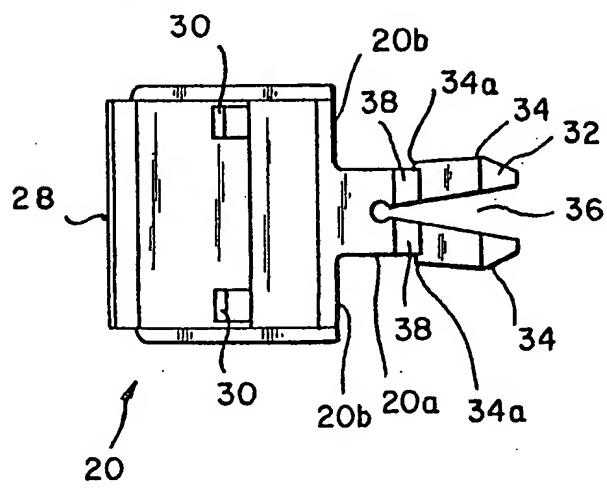


FIG. 3

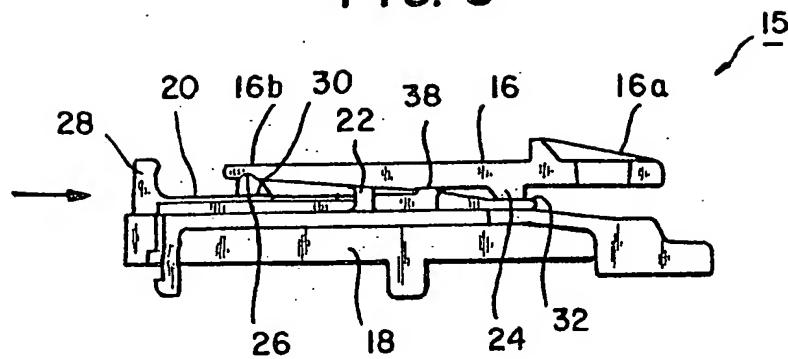


FIG. 4(a)

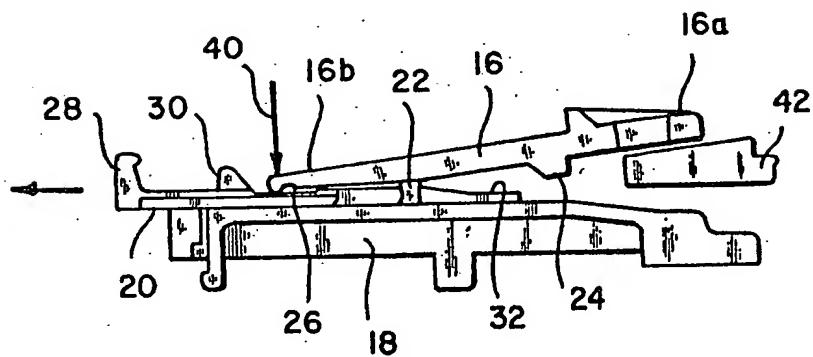


FIG. 4(b)

